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NEW TELEVISION CENTERS

Vestnik Svyazi (Communications Herald), No 5, 1955, Moscow, pages 10-11

Unsigned Article

The past year was marked by putting new television centers into operation, and also expanding and further improving the technical means of existing television centers.

At the end of last year the rebroadcasting television center in the city of Kalinin came into operation. The television signals and the signals of sound accompaniment are supplied to Kalinin from Moscow over a wire line of communications. Established in Kalinin has been an ultrashort-wave television station for rebroadcasting. It consists of 2 transmitters: one for transmission of picture signals (2 kw capacity) and the other for transmission of the sound accompaniment signals (1 kw capacity). The television rebroadcast center operates in the second frequency television channel. The transmitters have high qualitative indexes. They operate in one common antenna-feeder system. The antenna of the turnstile type has been put up on a free-standing tower 65 m in height.

The first broadcasts showed the completely satisfactory quality of the pictures and the sound accompaniment. According to reports received, the transmissions of the rebroadcasting television center are already being seen at points 30 to 40 km away from Kalinin.

In March of this year the Kharkov television center came into operation. Until completion of work in construction of a large studio, it will transmit small theatrical productions and motion-picture films from a temporary studio.

The first model of the equipment of a standard television center has been put in the center. The ultrashort-wave television radio station comprises a television transmitter of 5 kw capacity and a sound transmitter of 2.5 kw capacity. The television center operates in the second frequency channel.

In the television transmitter modulation is realized in preliminary stages with further amplification of modulated oscillations. It should be noted that this transmitter brings in very slight distortions and insignificantly lowers the fidelity of the transmitted picture. Both transmitters are convenient in operation and control; the latter is done from a common board equipped with video-control devices. With their help it is possible to verify the quality of the signal in the main sections of the transmitter's circuit. The transmitters operate in a common antenna-feeder system (turnstile type antenna).

The set and studio equipment of the Kharkov center is made up in the form of independent sets, one of which is designed for conducting studio transmissions, and the other, chiefly for film transmissions.

The new set and studio equipment of television centers is designed for station assembly from standard blocks. The equipment common for both sets — synchrogenerators, linear amplifiers, basic organs of operation and control — are put out in the film transmitter, which is at the same time the central set of the television center.

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In the film set 3 camera channels are provided; in the studio set 2 channels. Each camera channel consists of a transmitting camera, an intermediate amplifier, and a viewing device, equipped with an oscillograph.

At television centers designed only for out-of-studio and film broadcasting, where the transmission from the studio is limited to showing the announcer or scenes with a small number of actors, the third camera of the film set can be used for studio work.

The principle of switching uniform camera channels has been put at the basis of the construction of skeletal circuits of the standard television center. In this case the switching is done at the output of the channels (or intermediate amplifiers), where mixing is done or the alternate transmission of pictures from separate transmitting cameras.

Programs from a portable television station are conducted through a system of autonomous synchronization, for which purpose there is an independent synchrogenerator among the equipment of the station.

Oscilliographic devices of the channels permit observing oscillograms of the signal separately at frequencies of a multiple to line frequency and a multiple to half-frame frequency.

The transmitting tubes of Shmakov-Timofeyev have been installed in the studio cameras. Owing to this, illumination of objects cannot exceed 1,500 to 2,000 luxes. The studio cameras are supplied with a set of lens having focal distances of 28, 50, 100, and 135 mm. During the transmission one lens can be rapidly replaced by another by means of a revolving head that the operator controls.

A system based on the impulse lighting of the frame is used for projection of the picture of the cinema film on the photocathode of the transmitting tube.

Special television motion-picture film projectors are installed in the film projecting set. Provided in them are automatic electric drives for the shutter and film-tracking mechanism, owing to which their independent operation and phasing are possible. This makes it possible to combine the moment of opening the shutter with the moment of beginning the reversing of the frame scanning and running the motion picture film through.

The entire amplifying and control equipment, the blocks of feed, the synchrogenerator are placed in the control boards of the sets. This permits simplifying the set, reducing the total number of radio tubes and parts, improving the screening, and eliminating a cumbersome system of cable swinging in the cable channels.

The first transmissions of the Kharkov television center showed that the standard equipment secures a transmission with high-quality pictures and sound accompaniment.

A new portable television station was put into operation last year in Kiev. This station of the PTS-52 type is put into 2 ZIS-155 motor coaches; the main equipment including the control board, 3 camera channels, camera feed equipment, a system of synchronization, and also sound equipment, being accommodated in one coach, the equipment coach. Auxiliary equipment, and also reels with cable and so on are installed in the other motor coach. The portable television station operates on 3 cameras with highly sensitive tubes of the orthicon type with transfer of pictures.

At the beginning of the current year, the Riga center began television broadcasting. Set and studio equipment similar to that of the Kharkov television center has been installed at the Riga television center, which conducts film transmissions and small studio transmissions from a model scene and announcer studio. Work must be completed in the current year on the erection and equipment of the main television studio; a portable television station of the PTS-52 type will also be put into operation.

The Riga television center operates in the third frequency television channel.

In November 1954 trial transmissions began in Moscow of color television with a system of consecutive transmission of colors. In the present year experimental transmissions will be made from the test installation and at the same time work will be done in connection with the creation of a compatible system of color television.

In 1955 the second portable television station of the PTS-52 type will be put into operation at the Moscow television center to improve substantially the center's out-of-studio broadcasting; also for the same purpose basic work will be done on the equipment of the stationary television relaying point which will permit broadcasting television transmissions of plays and concerts from the large theatrical enterprises of Moscow (the State Academic Bolshoi Theatre USSR, its filial, the Hall of Columns of the House of Trade Unions, the State Academic Maly Theatre, the Moscow Academic Art Theatre, and a number of others). The equipment of the stationary television relaying point permits installing in the halls of theatrical enterprises up to 3 transmitting cameras with highly sensitive tubes, connected by cables with the equipment of the set of the relaying point, at the point where the technical personnel and stage directors who conduct the television transmission will be. The transmission of signals of the relaying point to the Moscow television center will be realized by means of a radio relay line.

Studio television broadcasting will also be improved during this year. Work has already begun at the Moscow television center on reconstruction of the studio set and replacement of the existing studio cameras by transmitting cameras with Shmakov-Timofeyev tubes.

The television relaying point in Leningrad will come into operation in the near future. It will make it possible to relay television transmissions from the Winter Stadium, the Theatre of Comedy, and also from the studio of the Leningrad radio house. It is planned to subsequently connect a number of other theatrical enterprises of the city to the relaying point.

FIGURE CAPTION

Figure [page 10 of original]. Transmitting television cameras and optical commutator of a standard television center.

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CONNECTION OF START-STOP REGENERATORS AT SUBSCRIBERS' TELEGRAPH STATIONS

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The article examines the problem of applying start-stop regenerative relaying for correction of telegraph signals transmitted in subscribers' telegraph (AT) communications, and presents the circuit of an accessory device which makes possible the use of one and the same relaying in both directions of transmission. The problem is also examined of the place of connecting these relayings in the circuits of the subscribers' telegraph stations.

The system of subscribers' telegraphy, which has been widely developed in Russia, is built on the principle shown in the schematic diagram of Figure 1. In this Figure GU is the main junction station,
OU is the oblast junction station,
RU is the rayon junction station,
Ab is the subscriber's telegraph installation.

As is evident from the drawing, the number of stations that participate in the establishment of a connection can be as many as 6.

To organize temporary communications between subscribers' sets which are located in different inhabited points, the channels of telegraphic relaying (TT) are customarily used. If besides, the line of transmission consists of several sections, then the distortions of telegraph signals, which arise in separate sections, summarizing accordingly, will reduce the reserve of communications stability. In certain cases they can even surpass the correcting capacity of the subscribers' start-stop equipment.

According to established standards, the channel of telegraphic relaying is considered good for operation if the magnitude of distortion does not exceed 10% on one section, 18% on 2 sections, and 24% on 3 sections.

The equipment of the subscribers' telegraph stations, which are in principle similar to the receiving-transmitting parts of simple telegraphic relayings, also introduce distortion. If the subscribers' telegraph stations are employed in the capacity of intermediate stations, then the distortions introduced by each of them amounts to 2 or 3%. But if they are used as terminals, then the distortions reach 5 to 10%. The explanation of the latter is that the subscribers' sets are connected in a semi-duplex circuit, and in the section from the station to the subscriber's set the transmission is accomplished by a single-pole method.

It is moreover necessary to consider the usual distortions introduced by the start-stop equipment itself, which can be increased because of the absence of constant skilled control of the subscribers' installations.

It follows that while the distortions conditioned by the equipment and channels are not summarized arithmetically, the subscribers' communications operating even through one intermediate station may nevertheless have an extremely small reserve of stability, inasmuch as the effective correcting capacity of the start-stop equipment is within the limits of 25 to 30%.

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As is known, the small reserve of communications stability stipulates the necessity of sufficiently accurate regulation of the phase of reception, the optimal position of the phase setter being varied in dependence on the number of the transit stations and channels which participate in one or another connection, the quality of tuning, and so forth. It is difficult to carry out this regulation under the operating conditions of subscribers' sets; the more so, since it demands of the service personnel not only expenditure of time but also adequate skill.

Therefore, to heighten the quality of subscribers' telegraph communications, the telegraph signals which are distorted in the process of their passage through separate sections of the line should be corrected. This can be realized by means of start-stop regenerative relayings which are connected at the transit stations of the subscribers' telegraph. The main junction stations of the subscribers' telegraph system must first of all be equipped with such relayings, or regenerators as it is customary to call them, inasmuch as the greatest number of transit connections passes through them. The need for regenerators will be less at oblast junction stations, since these stations are mainly intermediate only when connections are made between the subscribers of rayon junction stations.

Special research work has to be carried out to determine the total number and type of regenerators necessary for servicing the growing system of subscribers' telegraphy. However, it can be said with certainty that a large number of them will be needed for this purpose.

Considering the relatively high cost of regenerators, it is necessary first to elaborate methods of connecting them in the circuits of the subscribers' telegraph stations such that the most effective use of the indicated equipment will be secured. Soviet specialists have created an extremely simple additional device (DVU) which, considering the alternate character of the work of subscribers' sets, permits using every start-stop regenerator in both directions of transmission. Due to this device the required number of regenerators is halved.

The indicated device automatically reverses the input and output of the regenerator depending on which of the subscribers (the one calling or the one being called) conducts the transmission. Inasmuch as the transmission usually begins with the subscriber who makes the call, the initial operating position of the regenerator is connected in the circuit of this subscriber's transmission. But the reversing of the generator's input and output occurs only at those times when the subscriber called conducts the transmission.

The principle of the circuit of the additional device DVU is shown in Figure 2. This device consists of 3 relays: telegraph relay A and 2 telephone relays V and P. Relay A serves for reception of telegraph signals which enter from the side of the subscriber called and for control of the reception relay of the regenerator. The relay V realizes the connection of the regenerator, and the relay P switches over the regenerator from the circuit of transmission to the circuit of reception. The relay P has 3 windings. Winding I of this relay is the operating one; winding II the magnetizing; winding III retards the release of the armature by 250 to 300 milliseconds.

Let us examine the operation of the DVU circuit.

Connection of the regenerator: as long as the connection with the set of the subscriber called has not been completed, the elements of the DVU circuit are in a state of rest. Besides, the contacts v_1 and v_3 of

the circuit of transmission (terminals 1 to 4) and the circuit of reception (terminals 2 to 5) are connected straight with the result that a through line is created for passage of dialling impulses through the additional device DVU.

At the automatic station AT of the subscribers' telegraph the connection of the regenerator in the transmission circuit when a transit connection has occurred, occurs automatically by means of relay V. The latter operates from the reply signal (plus) which enters from the side of the subscriber called.

If regenerators are installed at manual service stations of the subscriber's telegraph, then it is not possible to use the action of the reply signal for their connection, since in this case the change of polarity (from minus to plus) occurs when the plug is put in the socket of the line going to the station called. Therefore, the connection of regenerators at stations of manual service must be done by hand by means of the push button KnV installed on the switchboard (in Figure 2 the connection of KnV is shown by dotted lines).

Transmission from the side of the subscriber making the call: The telegraph signals which enter the input 1 of the additional device DVU pass through the circuit: terminal 1, contact v_1, the left (in the diagram) contact and armature of relay A, the regenerator Reg, contacts p_1 and v_2, terminal 4.

At the same time at the input 5 a plus enters from the side of the subscriber called with the result that current passes through the winding of relay A and the winding I of relay P. Under the action of this current relay A holds its armature at the left contact. Relay P does not operate since current passes in the opposite directions in its windings I and II.

To the side of the subscriber making the call a plus is delivered through the contacts p_2 and v_3 and terminal 2.

Transmission from the side of the subscriber called: The first start (minus) signal entering from the line at terminal 5 passes, branching through the winding of relay A and the winding I of relay P. In consequence of this, the armature of relay A is thrown over to the right contact and transmits the start signal to the input of the regenerator. Since the direction of the current in winding I of relay P is changed, the latter operates.

Contact p_3 closes the winding III of relay II thereby preventing release of the armature of this relay during the passage of working signals which enter from the side of the subscriber called. Contact p_2 connects the output of the regenerator to terminal 2, i.e., to the channel going to the side of the subscriber making the call. The contact p_1 closes the straight circuit from terminal 1 to terminal 4, along which the plus will be delivered from the subscriber making the call to the subscriber called.

When the called subscriber finishes the transmission, the relay P releases its armature, and the regenerator is automatically switched over to the original position.

The duration of the relay P operation amounts to 8 to 10 milliseconds. Therefore, it succeeds in realizing the required switch over before the moment the start signal enters from the output of the regenerator, since

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the latter, as is known, always shifts the phase of the received signals a minimum by half the elementary signal. Secured by this is the undistorted transmission of the first signal received from the subscriber called.

The choice of a place to connect the regenerators in the circuit of the subscribers' telegraph stations also has great importance, in particular for automatic stations at which the regenerators must constantly be connected in appropriate circuits.

At the stations of manual service the question of the place of connecting the regenerators is decided simply enough. The input and output of every regenerator are connected with the corresponding sockets of the switchboard, and when necessary the operator, switching the transit connection, switches in the regenerator. For this purpose, the second plug of the cord pair used for connection with the required station, is put not in the socket of the channel but in the input socket of the regenerator. Its output socket is connected by an additional 3-wire cord to the channel socket. For connection of the regenerator the operator presses push button Kn V. If a station of manual service is called, then the push button should be pressed immediately after sending the call. But if a station of the automatic system is called, then the push button is pressed at the conclusion of dialling the number.

At stations of the automatic system the indicated problem has to be solved otherwise. In making transit connections at automatic stations circuits are created between the incoming group selectors IV-GI and the outgoing group selectors II-GI. The circuit of the station is designed in such a manner that in the process of making connections any of the free II-GI group selectors that belong to that group of directions among which is found the direction to the station being called, can be occupied by IV-GI group selectors. Consequently, in case of direct connection of the regenerators in the circuits which are formed between the IV-GI group selectors and the II-GI group selectors, their number must correspond to the number of II-GI group selectors. If it be considered that the II-GI group selectors participate in switching not only of transit communications, but also of communications originating from the local subscribers of the given station, then the solution indicated would be erroneous. But to divide each group of II-GI group selectors into 2 independent subgroups designed for separate service of one and another connections is irrational because of the substantial loss in the number of selector devices.

The most expedient solution which, without dividing the general groups of the II-GI group selectors into subgroups, affords the possibility of using the regenerators exclusively for transit loads, consists of using special transit selectors. The number of the latter must correspond to the number of regenerators. These selectors are included in the circuit between the regenerators and the II-GI group selectors, the contact field of the transit selectors being connected in parallel with the field of the corresponding decades of the I-GI group selectors.

The usual step-by-step rotating selectors of the Shi-11 (on 11 contacts) can be employed in the capacity of transit selectors. Their function comprises the free selection of unoccupied II-GI group selectors in the interval of time between the passage of 2 series of impulses of dialling controlled by the work of IV-GI group selectors and II-GI group selectors.

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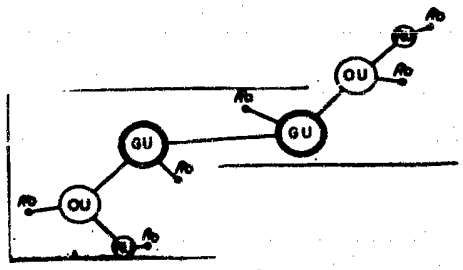

FIGURE 1

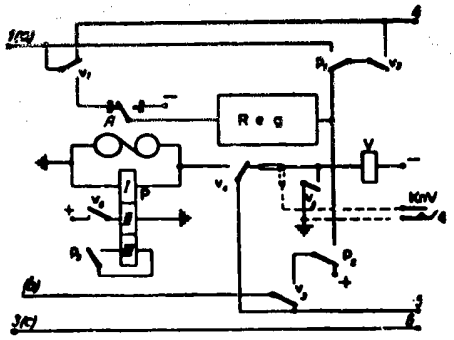

FIGURE 2

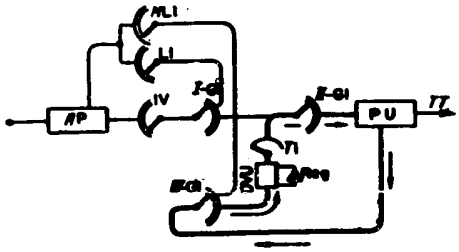

FIGURE 3

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